Intelligent Message Processor (IMP) Technical Datasheet

INTRODUCTION

International Roaming capabilities continue to increase in importance as mobile subscribers expect easy access to wireless services anywhere, anytime. International roaming traffic volumes are expected to continue to increase and operators can gain substantial revenue increases by efficiently providing international roaming capabilities to their own subscribers and also by effectively allowing international travelers to roam into their markets.

However, to realize the benefit from such revenue increases, wireless operators need support to overcome the complex challenges associated with enabling international roaming services. Providing international roaming services requires operators to deal with issues that range from disparity of numbering schemes, different signaling systems and network elements, protocol variations, and message routing requirements.

The solution to these problems and effectiveness of maximizing the international roaming revenue potential lies with the VeriSign Intelligent Message Processor (IMP). This service platform provides mobile operators with a centralized solution that addresses each element of establishing and maintaining a seamless international roaming service offer.

The VeriSign IMP platform is described in detail in the below sections.

SERVICE OVERVIEW

With the VeriSign IMP, when your subscribers travel around the world, they receive seamless roaming services and enjoy the features and security they have in their home areas. In addition, the VeriSign IMP provides support for international roamers visiting your service area.

The IMP is a unique, centralized solution which acts as a roaming gateway for VeriSign customers. It serves as an intelligent message processor that answer switch, signaling, routing and numbering issues linked to international roaming services. The IMP is a dual redundant, telecommunications-grade platform, which has been implemented within the VeriSign Network as outlined in the high level diagram below.

The IMP simultaneously emulates a Visitor Location Register (VLR) for the home carrier's MSCs and a Home Location Register (HLR) for the serving carrier's MSCs.

The SCP is the step between the HLR and the VLR. When messages are traveling from the HLR to the VLR, the IMP acts as the HLR; when messages are traveling from the VLR to the HLR, the IMP acts as the VLR.

Signaling System 7 (SS7) transactions, related to the roaming subscriber, are launched from the home carrier and received by the VeriSign IMP. Located between the home carrier's MSCs and the serving carrier's MSCs, the VeriSign IMP is able to intercept, interpret and

modify specific parameters within the ANSI-41 protocol at the MTP and TCAP layer to resolve protocol and signaling issues commonly encountered in international roaming when using ANSI-41.

The IMP is an integral part of the VeriSign SS7 transport infrastructure and provides services to the connected carriers in a hosted environment.

KEY BENEFITS

- Cost savings and Simplified roaming setup by presenting a single point code and known parameter behaviors to both connected carriers and roaming partners.
- Support with International Point Code resolution.
- Interoperates with multiple versions of ANSI-41.
- Enables call delivery to diverse international serving carriers with International Numbering Translation.
- Provides full-service roaming support including location registration, PIN provisioning, and call origination and termination services.

KEY FEATURES OF THE VERISIGN IMP PLATFORM

- Global Title for Message Invokes:
  Provides a single default point code for all messaging that will route message invokes to the correct destination. Frees operator from having to actively manage line ranges in the VLR.
- Serving carrier / MSC determination:
  The ANSI-41 protocol contains point codes and MSCID's at the TCAP layer of some roaming messages that may impact how a message should be routed or handled. The VeriSign IMP examines each ANSI-41 message at the TCAP layer and adjusts these parameters for proper message handling.

- Temporary Local Directory Number (TLDN) Modification:
  Usage and formatting of TLDNs returned in ANSI-41 TCAP messages are not well defined within the standards. Different roaming partners may use different standards and definitions. The TLDN Modification function in VeriSign's IMP allows the carrier to modify the TLDN returned from each roaming partner or serving market. Adjusting for dialing prefixes, country codes, area codes, etc., enables calls to be routed correctly to the serving MSC.

- System Identifier (SID) Mapping:
  Usage of SID Mapping outside of North America is not strictly enforced by standards. As a result, there may be SID conflicts when roaming with carriers outside of North America. VeriSign's IMP allows the home carrier to modify the SID returned in the ANSI-41 TCAP messages to resolve SID conflicts.

- ANSI-41 Version Conversion:

With various versions of ANSI-41 in use today, some parameters are incompatible between versions of the protocol. VeriSign's IMP allows the transparent conversion between ANSI-41 Rev. A and Rev. C/D.

- Signaling Connection Control Part (SCCP) to Multipurpose Transaction Protocol (MTP) Conversion:
  Due to country-specific requirements or carrier requirements, some carriers are using global title routing in the SCCP field instead of point code routing in MTP fields commonly used today. VeriSign's IMP handles conversion between the two types of routing methods.

- Point Code/Network Indicator Conflict Resolution
  The VCS SCP/Network Access system can handle Point Code conflicts that exist between your network and the rest of the ANSI network

- IS-41 Parameter Deletion / Insertion:
  Various MSC vendors or various countries may use slightly different implementations of ANSI-41. This can cause interoperability problems between carriers. VeriSign's IMP allows the home carrier to modify specific ANSI-41 parameters sent to or received from incompatible MSCs at the serving market to avoid decoding problems.

- Default Positive Fraud Mitigation
  When the IMP receives a REGNOT invoke, it always provides a response to the VLR. This occurs whether the HLR responds to the REGNOT or not (due to network or HLR failure). By always providing a response to the VLR, the VLR does not go into "default processing mode". In many service areas, a serving system will grant calling privileges to mobile stations when a REGNOT acknowledgement is not received.

- Welcome SMS Service
  Welcome SMS Service is an optional service that allows the Home operator to send pre-defined SMS messages to outbound roaming subscribers while these subscribers roam on the operator's international roaming partners' networks. The Welcome SMS messages are programmed to be sent to the international roaming subscribers' handset. These welcome SMS messages can be used to assist outbound international roamers on dialing access or to provide local assistance while roaming internationally.

IMP ARCHITECTURE

ANSI-41 Messaging

The IMP architecture currently supports ANSI-41 Revision A & Revision C messaging. Unrecognized messages are communicated to the originating entity as “rejects” and are flagged to the Network Operations Center.

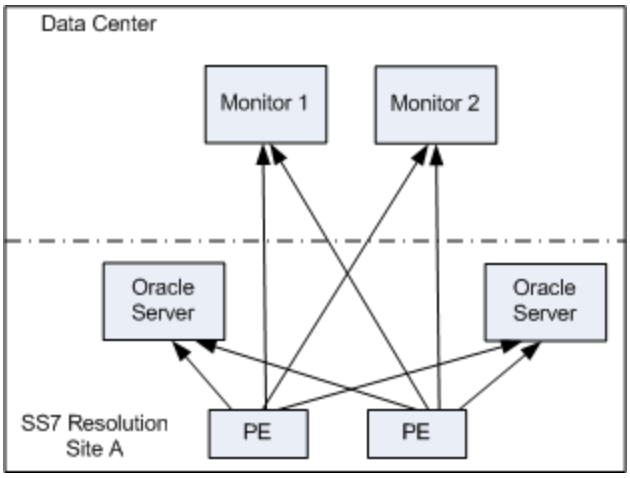
Network Connectivity

The **IMP** platform is connected to the telecommunications network via SS7 A-links to a STP pair. Other data networks communicate via TCP/IP connection or a web interface. The IMP supports the ANSI SS7 protocol up to the TCAP layer. Physical connectivity is supported by V.35 at speeds of up to 64kbps. The IMP is addressed as a single point code.

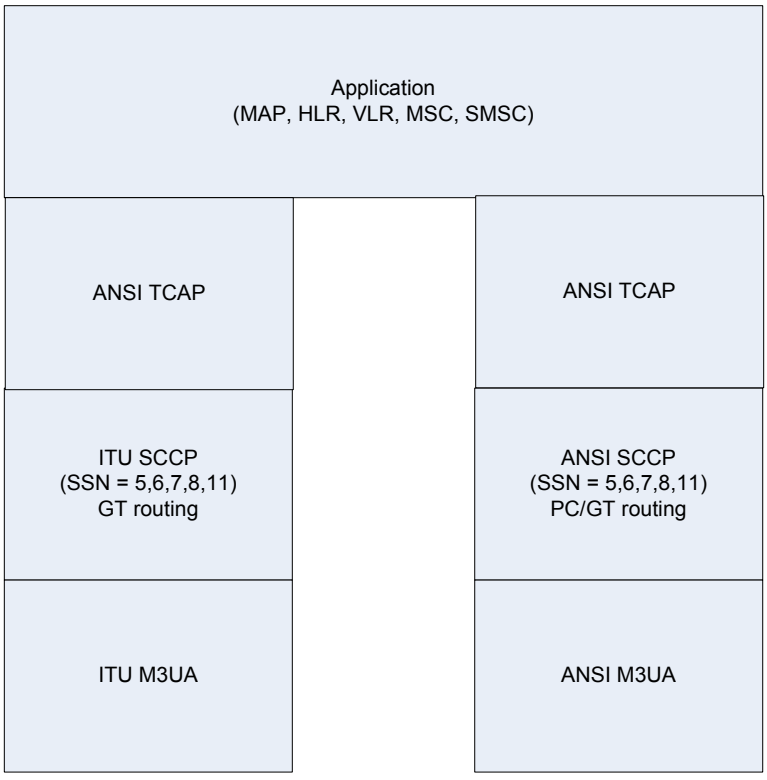
Performance

The size and capacity of the IMP architecture are maintained to provide at least the minimum in performance expectation indicated by industry standards for ANSI-41 subscriber validation and call delivery. This performance capability is tested and maintained by VeriSign.

The following diagram shows the IMP data center and the resolution sites:



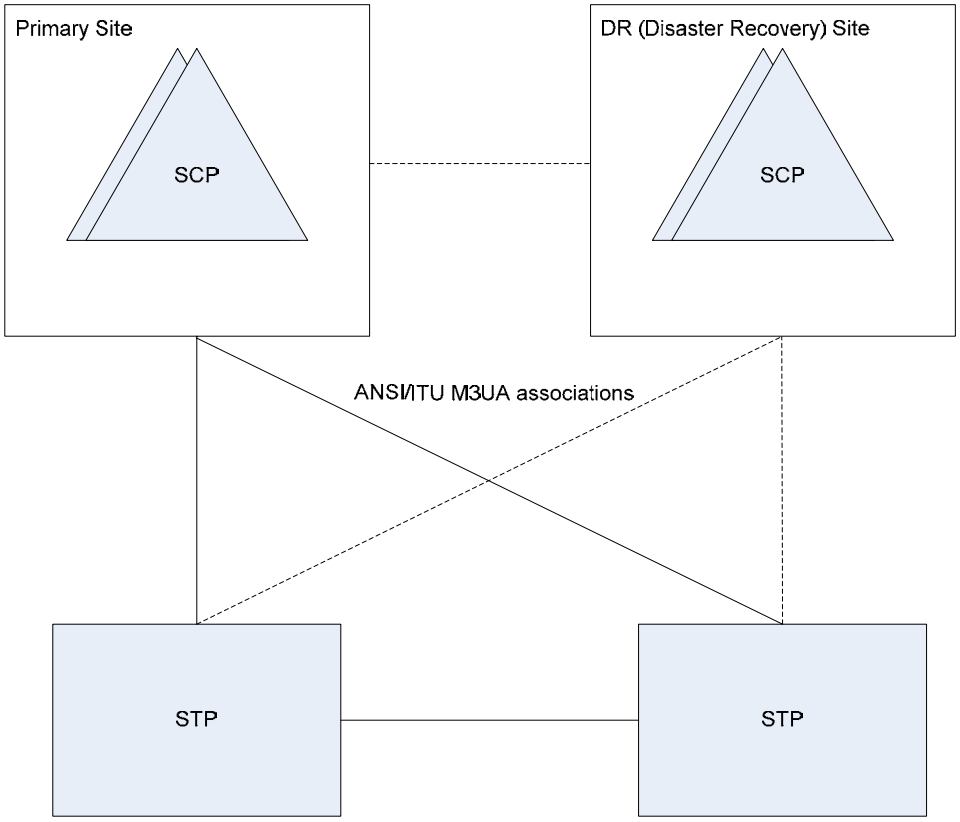
The following diagram shows the SCP software architecture:



IMP DEPLOYMENT

The SCP application is deployed with a Primary Site and a Disaster Recovery Site. The Disaster Recovery Site runs a backup SCP instance if the primary site is down or in maintenance.

The following diagram illustrates the IMP deployment structure:



IMP SERVICES IN ACTION

VeriSign IMP provides support for your customers when they roam internationally, as well as international roamers visiting your service area. For example, when a roamer registers in your service area:

1. Using the roamer's unique identifier (MIN for ANSI-41), the MSC/VLR launches a message to the VeriSign IMP for routing;
2. The IMP performs the appropriate translations and screening, then routes the message to the home carrier network;
3. The roamer's home MSC/HLR validates the roamer and sends the appropriate profile information to the serving market to allow service to continue.

TECHNICAL FEATURES OF THE IMP SERVICE

The following table lists the technical features of the IMP service and its capabilities.

Feature	Capabilities
MTP3/M3UA	• Supports SIGTRAN links • Handles both ITU and ANSI M3UA associations
SCCP layer	• Can route messages based on Point Code • Can route messages based on Global Title* • Can define 10,000 remote routes • Can signal to (10,000 * 6 = 60,000) remote applications • Handles both ITU and ANSI SCCP *Need to verify whether we can handle all TT
TCAP layer	• Handles only ANSI layer
ANSI-41 MAP	• Supports ANSI-41 D standard • Supports removal of ANSI-41 E parameters from ANSI-41 D messages • IMSI support • Converts messages from Rev C/D/E to Rev A • Can add/delete/modify parameters for messages (Refer to the IMP Release 1 ANSI-41 Parameter Modification Support section for details)
Application	• Supports dynamic registration, where the subscriber need not be pre-provisioned in the IMP • Supports pinning feature to combat fraud • Allows a subscriber to be marked as VIP, and VIP status allows that subscriber to make/receive calls without pinning • Provides capability to configure how a message needs to be built •

ANSI-41 MESSAGES SUPPORTED

The following ANSI-41 messages are supported with the IMP Service:

- Authentication Directive
- Authentication Fail Report
- Authentication Request
- Authentication Status Report
- Base Station Challenge
- Call Data Request
- Count Request
- Feature Request
- Information Directive
- Location Request
- MS Inactive
- Origination Request
- Qualification Request
- Qualification Directive
- Redirection Request
- Registration Notification
- Registration Cancellation
- Route Request
- Service Profile Request
- Service Profile Directive
- SMS Delivery Point to Point
- SMS Notification
- SMS Request
- Transfer to Number Request

IMP RELEASE 1 ANSI-41 PARAMETER MODIFICATION SUPPORT

The following table gives the actions that can be performed on each of the ANSI-41 revision A, B, C, or D parameters that are relevant to the supported messages. Some parameters are mandatory for certain messages and optional for others. If a parameter is mandatory for a given message, the IMP will not delete it.

Parameter Name	Add	Delete	Modify
AccessDeniedReason	X	X	X
ActionCode	X	X	X
AlertCode	X	X	X
AlertResult	X	X	X
AnnouncementCode		X	
AnnouncementList		X	
AuthenticationAlgorithmVersion		X	
AuthenticationCapability	X	X	X
AuthenticationData		X	
AuthenticationResponse		X	
AuthenticationResponseBaseStation		X	
AuthenticationResponseUniqueChallenge		X	
AuthorizationDenied	X	X	X
AuthorizationPeriod	X		X
AvailabilityType	X	X	X
BillingID	X	X	X
BorderCellAccess		X	
CallHistoryCount		X	
CallHistoryCountExpected		X	
CallingFeaturesIndicator	X	X	X
CallingPartyNumberDigits1	X	X	X
CallingPartyNumberDigits2	X	X	X
CallingPartyNumberString1	X	X	X
CallingPartyNumberString2	X	X	X
CallingPartySubAddress		X	
CancellationDenied	X	X	X
CancellationType	X	X	X
CarrierDigits	X	X	X
CDMAPrivateLongCodeMask		X	
ConditionallyDeniedReason	X	X	X
ConferenceCallingIndicator	X	X	X
ConfidentialityModes	X	X	X
ControlChannelData		X	
CountUpdateReport	X	X	X
DeniedAuthorizationPeriod	X	X	X
DenyAccess	X	X	X
DeregistrationType	X	X	X
DestinationDigits	X	X	X

Parameter Name	Add	Delete	Modify
Digits	X	X	X
DMH_AccountCodeDigits	X	X	X
DMH_AlternateBillingDigits	X	X	X
DMH_BillingDigits	X	X	X
DMH_RedirectionIndicator	X	X	X
ExtendedMSCID	X	X	X
ExtendedSystemMyTypeCode	X	X	X
FeatureResult	X		X
GeographicAuthorization	X	X	X
GroupInformation	X	X	X
LegInformation	X	X	X
LocationAreaID	X	X	X
MessageWaitingNotificationCount		X	
MessageWaitingNotificationType	X	X	X
MobileDirectoryNumber	X	X	X
MSCID	X	X	X
MSCIdentificationNumber	X	X	X
NoAnswerTime	X	X	X
OneTimeFeatureIndicator	X	X	X
OriginationIndicator	X		X
OriginationTriggers	X	X	X
PACAIndicator	X	X	X
PC_SSN	X	X	X
PilotBillingID	X	X	X
PilotNumber	X	X	X
PreferredLanguageIndicator	X	X	X
QualificationInformationCode	X	X	X
RANDC		X	
RandomVariable		X	
RandomVariableSSD		X	
RandomVariableUniqueChallenge		X	
ReceivedSignalQuality		X	
RedirectingNumberDigits	X	X	X
RedirectingNumberString	X	X	X
RedirectingNumberSubaddress		X	
RedirectionReason	X	X	X
ReportType	X	X	X
RestrictionDigits	X	X	X
RoutingDigits	X	X	X
SenderIdentificationNumber	X	X	X
SharedSecretData		X	
SignalingMessageEncryptionKey		X	
SMS_AccessDeniedReason	X	X	X
SMS_Address	X	X	X

Parameter Name	Add	Delete	Modify
SMS_BearerData		X	
SMS_CauseCode	X	X	X
SMS_ChargeIndicator	X	X	X
SMS_DestinationAddress	X	X	X
SMS_MessageCount	X	X	X
SMS_MessageWaitingIndicator	X	X	
SMS_NotificationIndicator	X	X	X
SMS_OriginalDestinationAddress	X	X	X
SMS_OriginalDestinationSubaddress		X	
SMS_OriginalOriginatingAddress	X	X	X
SMS_OriginalOriginatingSubaddress		X	
SMS_OriginatingAddress	X	X	X
SMS_OriginatingRestrictions	X	X	X
SMS_TeleserviceIdentifier	X	X	X
SMS_TerminationRestrictions	X	X	X
SPINIPIN	X	X	X
SPINITriggers	X	X	X
SSDNotShared	X	X	X
SSDUpdateReport	X	X	X
SystemAccessData	X	X	X
SystemAccessType	X	X	X
SystemCapabilities	X	X	X
SystemMyTypeCode	X	X	X
TerminalType	X	X	X
TerminationAccessType	X	X	X
TerminationList		X	
TerminationRestrictionCode	X		X
TerminationTreatment	X	X	X
TerminationTriggers	X	X	X
TransactionCapability	X	X	X
UniqueChallengeReport	X	X	X
UpdateCount	X	X	X
VoicePrivacyMask		X	